

REMARKS

Claims 1-10 have been examined. Claims 1 and 6 are amended herein. Claims 11-20 have been added. Therefore, claims 1-20 are now pending. Of the pending claims, 1 and 11 are independent.

The numbered paragraphs below correspond to the similarly numbered paragraphs of the Office Action mailed September 11, 2001.

1.-3. No response needed.

It appears that one of the references applied to certain claims in the last Action (namely, GB 2,143,299) was not listed in the Notice of References Cited [Form PTO-892] attached to the Action. The Examiner is kindly requested to provide a further such Notice with the next communication so that that reference will be formally noted in the printed patent.

Drawings

4. Applicant should verify that (1) all reference characters in the drawings are described in the detailed description portion of the specification and (2) all reference characters mentioned in the specification are included in the appropriate drawing Figure(s) as required by 37 CFR 1.84(p)(5).

4. The undersigned attorney has reviewed the specification and drawings. All reference characters in the drawings are referred to in the specification and all reference characters mentioned in the specification are included in the drawings. Accordingly, this requirement has been met.

Specification

5. The specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

5. The undersigned attorney has checked the specification and has corrected the misspelled words found, including labor, vulcanization and inhomogeneous. No new matter has been added. Accordingly, this requirement has been met.

6. The disclosure is objected to because of the following informalities:

a. terms such as "labour" and "vulcanization" throughout the specification should be revised to reflect customary U.S. spelling.

Appropriate correction is required.

6. As was noted above, the spelling of "labor" and "vulcanization" has been corrected. Accordingly, this requirement has been met.

7. The abstract is acceptable.

7. No response needed.

8. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed (MPEP 606.01).

8. The title has been amended, as required.

Claim Rejections - 35 U.S.C. § 112, second paragraph

9. Claims 1-10 are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The second paragraph of 35 USC 112 requires a claim to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Under *In re Hammack*, 166 USPQ 204 (CCPA 1970) and *In re Moore*, 169 USPQ 236 (CCPA 1971), claims must be analyzed to determine their metes and bounds so that it is clear from the claim language what subject matter the claims encompass. This analysis must be performed in light of the applicable prior art and the disclosure. The definiteness of the claims is important to allow others who wish to enter the market place to ascertain the boundaries of protection that are provided by the claims. *Ex parte Kristensen*, 10 USPQ 2d 1701, 1703 (BPAI 1989). The pending claims fail to particularly point out and distinctly claim the subject matter which applicant regards as the invention and are therefore of indeterminate scope for the following reasons:

10. In the instant application, it appears that the preambles of claims 1-10 set forth that a subcombination of the support device is being claimed and the centrifugal separator is only functionally recited. The scope of the claims is clear as long as no further mention of the centrifugal separator appears in the claims, or the bodies of the claims refer to the centrifugal separator in a functional manner. A question arises as to whether the claims recite a combination or subcombination when the centrifugal separator is positively recited within the bodies of the claims wherein an inconsistency develops in the claims. The preamble indicates a subcombination of the support device, while in the bodies of one or more claims, there is at least one occurrence of a positive recital of structure indicating that the combination of the support device and centrifugal separator is being claimed. It is not clear if Applicant's intent is to claim merely the support device or the support device in combination with the centrifugal separator.

Claims 1-10 are therefore inconsistent and indefinite because the preambles of the claims recite the subcombination (the support device) for use with the combination (the support device in combination with the centrifugal separator) yet the elements of the support device and centrifugal separator appear to be claimed in structural combination in the bodies of the claims. If the elements of the invention are claimed in combination in the bodies of the claims, the preambles must also claim them in combination or the subject matter of the preambles would not be considered consistent with limitations recited in the bodies of the claim rendering the scope of the claims indefinite. In the instant case, it is not clear as to whether the claims are intended to be combination claims of the support device and centrifugal separator or intended to be subcombination claims of the support device only. The question has arisen based on the present claiming of the "and which each [support member] is provided between the bearing member and the frame member and has a longitudinal axis extending outwardly with respect to the axis" (claim 1) and "the longitudinal axis of the support members extends substantially radially with respect to the axis of rotation (claim 7). Since a positively recited orientation between the subcombination of the support device and the centrifugal separator is set forth, it appears that there is at least one occurrence of a positive recital of structure indicating that the combination of the support device and centrifugal separator is being claimed which renders the scope of the claims indefinite. For purposes of the prior art, the claims are being considered to be drawn to the subcombination of the support device only.

9.-10. Although claims 1-10 are urged to have been clear as presented, Claim 1 has been amended to more clearly recite that it is directed to a support device for a spindle and not to a support device in combination with a centrifugal separator. Claims 2-10 depend either directly or indirectly from claim 1 and are therefore similarly directed.

New claims 11-20, however, are clearly directed to a centrifugal separator having a spindle support device. No new matter has been added as the new claims are clearly supported by the specification and drawings as filed.

Accordingly, it is urged that the rejection of claims 1-10 under Section 112, second paragraph, is clearly overcome and that claims 1-20 all clearly comply with Section 112, second paragraph.

Claim Rejections - 35 U.S.C. § 103

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

12. Claims 1-10 are rejected under 35 U.S.C. § 103(a) as being unpatentable over WO 97/13583 in view of GB 2143299.

WO 97/13583 discloses the recited support device for a centrifuge substantially as claimed including support members comprising a helical spring element 6 having an axis disposed radially with respect to the axis of rotation of the centrifuge 5; and spring element pretensioning means or adjustable stop members 12 or 13. WO 97/13583 does not disclose the recited rubber material in the spaces between the adjacent rounds or turns of the spring element. GB 2143299 discloses a composite spring suitable for use in industrial vibration and shock isolators (Page 1, lines 119-122) including a helical spring element 10 wherein various materials such as a rubber material 15 (Page 1, lines 107-111) is formed between adjacent rounds or turns of the spring element as seen in Figure 1. The spring element 10 is embedded in and thus fixedly connected to the rubber material 15. It would have been prima facie obvious to one having ordinary skill in the art, at the time applicant's invention was made, to have provided rubber material in the spaces between the adjacent rounds or turns of the spring element in the spring elements of WO 97/13583 as disclosed by GB 2143299 for the purposes of (a) eliminating the inherently poor damping properties of a metal coil spring which permit high and low frequency vibration from being transmitted; (b) providing ample support while providing good variable damping properties at both low and high frequencies; (c) to control the transmission of vibration throughout the length of the spring; and (d) to provide support in any system in which high axial and lateral stiffness is required with effective damping and minimum loss of support with age (Page 1, lines 10-20, lines 44-54, and lines 98-121).

With regard to claim 6, the product-by-process limitation in the claim (i.e., the manner in which the spring material is fixedly connected to the rubber material) does not impart Patentability to the claims per MPEP 2113.

11.-12. A purpose of the present invention is to provide a support device for a centrifuge rotor spindle, which has an uncomplicated construction and which has an improved resiliency to

the movements of the rotor spindle in relation to the stationary parts of the centrifugal separator. At the same time, these movements can be damped by the invention in an optimal manner. An import task of the support device according to the present invention is to optimize the damping properties as well as the stiffness with regard to the relative movements of the rotor spindle. A proper stiffness is important in order to obtain a correct critical number of revolutions. A proper damping is also of significant importance. If the damping exceeds a certain level, too much heat is generated, and if the damping is too low the system becomes unstable. These underlying physical properties of course limit the construction possibilities to one of ordinary skill who is trying to achieve further requirements of the construction. For instance, the support device needs to be housed within a very small space, and it is therefore desirable to provide resiliency as well as damping in a single element.

It is respectfully urged that the asserted combination of WO 97/13583 and GB 2,143,299 would not have rendered the claims 1-10 obvious to one of ordinary skill in the art at the time the invention was made. The rejection is respectfully traversed.

The technique disclosed in WO 97/13583 very much corresponds to the technique disclosed in WO 89/10794 which is discussed in the instant specification, at page 2. WO 97/13583 discloses a support device for a centrifugal separator, wherein the support device includes helical spring elements extending in a radial direction with regard to the rotational axis of the centrifuge rotor spindle. However, the helical spring elements of WO 97/13583 are not provided with any damping members as called for in the claims under examination.

GB 2,143,299 discloses a load-bearing element, which includes a helical spring 10 and a damping member 15 of an elastic polymeric material. The helical spring 10 is completely embedded in the polymeric damping material forming an annular or tubular element. GB 2,143,299 does not disclose or suggest or include any hint of a centrifugal separator. Some possible applications of the device according to the prior art document are mentioned in the specification and include vehicle suspension springs and shock absorbers, industrial vibration and shock isolators and cam-follower mechanisms preventing the phenomenon known as "follower bounce" normally created by spring surge which causes rapid failure of valve springs used in engines (see page 1, lines 119-125 of the reference). Thus, this document does not include any disclosure or suggestion of an application similar to one with a centrifugal rotor

spindle, i.e., to be radially provided around a spindle which is rotating with very high rotary velocities. Moreover, the load-bearing element of GB 2,143,299 includes a fairly complicated construction with many different parts such as the helical spring element, the first damping member 15, damping member 17 provided outside the annular damping member 15, annular or tubular steel support members 16 and 18 enclosing the helical spring 10, damping member 15 and damping member 17, and fasteners 19 extending in a radial direction through the inner steel support 16, the damping member 15, the damping member 17 and the outer steel support 18. Consequently, it is strongly urged that the prior art structure would not be suitable for the conditions which prevail in a centrifuge separator where the rotor rotates at a very high rotational velocity.

In summary, therefore, it is urged that there is no suggestion to combine the references (WO 97/13583 and GB 2,143,299) being applied to the claims in this section of the Action. Furthermore, there is no disclosure or suggestion of damping members in the device of WO 97/13583 such as those called for in the claims under examination, and no suggestion to modify the device of WO 97/13583 to arrive at the device of the present claims. It is urged, therefore, that claims 1-10 would not have been obvious to one of ordinary skill in the art over the cited references at the time the claimed invention was made. The rejection has therefore been overcome. It is urged as well that claims 11-20 are also allowable over the asserted combination for at least the same reasons.

13. Claims 1-10 are rejected under 35 U.S.C. § 103(a) as being unpatentable over WO 97/13583 in view of Rushmore.

WO 97/13583 discloses the recited support device for a centrifuge substantially as claimed including support members comprising a helical spring element 6 having an axis disposed radially with respect to the axis of rotation of the centrifuge 5; and spring element pretensioning means or adjustable stop members 12 or 13. WO 97/13583 does not disclose the recited rubber material in the spaces between the adjacent rounds or turns of the spring element. Rushmore discloses a composite spring suitable for use in high speed mechanisms (Col. 1, lines 1-3) including a helical spring element 1 wherein a rubber material 2 (Col. 1, lines 36-42) is formed between adjacent rounds or turns of the spring element as seen in Figure 4. The spring element 1 is embedded in and thus fixedly connected to the rubber material 2. It would have been prima facie obvious to one having ordinary skill in the art, at the time applicant's invention was made to have provided rubber material in the spaces between the adjacent rounds or turns of the spring element in the spring elements of WO 97/13583 as disclosed by Rushmore for the purposes of preventing and/or damping vibrations (Col. 1, lines 36-50 and Col. 2, lines 56-60).

With regard to claim 6, note the patent to Rushmore teaches that the spring material is fixedly connected to the rubber material by vulcanization (Col. 1, lines 39-42 and Col. 3, lines 6-13), however, the product-by-process limitation in the claim (i.e., the manner in which the spring material is fixedly connected to the rubber material) does not impart Patentability to the claims per MPEP 2113.

13. The asserted rejection is respectfully traversed.

The Action rejects claims 1-10 over the combination of WO 97 13583 and U.S. 2,230,069 (Rushmore). WO 97 13583 is discussed above and that discussion is hereby incorporated here. Rushmore discloses a spring element having the primary object of overcoming intercoil, elasticity-inertia vibration superposed on the normal compression and expansion movements of a helical spring-coil. Rushmore discloses a spring element including a helical spring 1 embedded in a rubber coating 2. However, the rubber material 2 is not a continuous tube or rod element but is cut by means of the knife mechanism 6, 7 to form a helical rubber element 2. Consequently, the structure of the element disclosed in Rushmore differs from the structure of the damping element of the present invention. Furthermore, Rushmore does not even refer to the helical element as such but to a method of making a non-vibratory helical compression spring element. The main application area of the helical element appears to be for the valves of a high-speed internal combustion engine. Consequently, there is no disclosure or suggestion of centrifugal separators or supporting a centrifuge rotor spindle.

In summary, therefore, it is urged that there is no suggestion to combine the references (WO 97/13583 and U.S. 2,230,069) being applied to the claims in this section of the Action. Furthermore, there is no disclosure or suggestion of damping members in the device of WO 97 13583 such as those called for in the claims under examination, and no suggestion to modify the device of WO 97 13583 to arrive at the device of the present claims. It is urged, therefore, that claims 1-10 would not have been obvious to one of ordinary skill in the art over the cited references at the time the claimed invention was made. The rejection has therefore been overcome. It is urged as well that claims 11-20 are also allowable over the asserted combination for at least the same reasons.

14. Claims 1-10 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Kopf in view of GB 2143299.

Kopf discloses the recited support device for a centrifuge substantially as claimed including support members comprising a helical spring element 15 having an axis disposed radially with respect to the axis of rotation of the centrifuge attached to spindle 10; and spring element pretensioning means or adjustable stop members 17. Kopf does not disclose the recited rubber material in the spaces between the adjacent rounds or turns of the spring element. GB 2143299 discloses a composite spring suitable for use in industrial vibration and shock isolators (Page 1, lines 119-122) including a helical spring element 10 wherein various materials such as a rubber material 15 (Page 1, lines 107-111) is formed between adjacent rounds or turns of the spring element as seen in Figure 1. The spring element 10 is embedded in and thus fixedly connected to the rubber material 15. It would have been prima facie obvious to one having ordinary skill in the art, at the time applicant's invention was made, to have provided rubber material in the spaces between the adjacent rounds or turns of the spring element in the spring elements of Kopf as disclosed by GB 2143299 for the purposes of (a) eliminating the inherently poor damping properties of a metal coil spring which permit high and low frequency vibration from being transmitted; (b) providing ample support while providing good variable damping properties at both low and high frequencies; (c) to control the transmission of vibration throughout the length of the spring; and (d) to provide support an any system in which high axial and lateral stiffness is required with effective damping and minimum loss of support with age (Page 1, lines 10-20, lines 44-54, and lines 98-121).

With regard to claim 6, the product-y-process limitation in the claim (i.e., the manner in which the spring material is fixedly connected to the rubber material) does not impart patentability to the claims per MPEP 2113.

14. The asserted rejection of claims 1-10 as allegedly being unpatentable over Kopf (U.S. 2,487,343) in view of GB 2,143,299 is respectfully traversed.

Kopf discloses a centrifugal separator having a support device with spring elements of a kind very similar to those disclosed in WO 97/13583, which reference is referred to in paragraphs 12 and 13 of the Action. Consequently, the combination of these two documents does not add anything of substance beyond the combination of WO 97 13583 and GB 2,143,299, which has been discussed above at ¶ 11-12. The remarks made there are therefore incorporated here by reference.

In summary, therefore, it is urged that there is no suggestion to combine the references (Kopf and GB 2,143,299) being applied to the claims in this section of the Action. Furthermore, there is no disclosure or suggestion of damping members in the device of Kopf such as those called for in the claims under examination, and no suggestion to modify the device of Kopf to

arrive at the device of the present claims. It is urged, therefore, that claims 1-10 would not have been obvious to one of ordinary skill in the art over the cited references at the time the claimed invention was made. The rejection has therefore been overcome. It is urged as well that claims 11-20 are also allowable over the asserted combination for at least the same reasons.

15. Claims 1-10 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Kopf in view of Rushmore.

Kopf discloses the recited support device for a centrifuge substantially as claimed including support members comprising a helical spring element 15 having an axis disposed radially with respect to the axis of rotation of the centrifuge attached to spindle 10; and spring element pretensioning means or adjustable stop members 17. Kopf does not disclose the recited rubber material in the spaces between the adjacent rounds or turns of the spring element. Rushmore discloses a composite spring suitable for use in high speed mechanisms (Col. 1, lines 1-3) including a helical spring element 1 wherein a rubber material 2 (Col. 1, lines 36-42) is formed between adjacent rounds or turns of the spring element as seen in Figure 4. The spring element 1 is embedded in and thus fixedly connected to the rubber material 2. It would have been prima facie obvious to one having ordinary skill in the art, at the time applicant's invention was made, to have provided rubber material in the spaces between the adjacent rounds or turns of the spring element in the spring elements of Kopf as disclosed by Rushmore for the purposes of preventing and/or damping vibrations (Col. 1, lines 36-50 and col. 2, lines 56-60)

With regard to claim 6, note the patent to Rushmore teaches that the spring material is fixedly connected to the rubber material by vulcanization (Col. 1, lines 39-42) and Col. 3, lines 6-13), however the product-by-process limitation in the claim (i.e., the manner in which the spring material is fixedly connected to the rubber material) does not impart Patentability to the claims per MPEP 2113.

15. The asserted rejection of claims 1-10 as allegedly being unpatentable over Kopf in view of Rushmore is respectfully traversed.

Again, since Kopf discloses a centrifugal separator having a support device with spring elements of a kind very similar to those disclosed in WO 97 13583, discussed above, and since Rushmore is also discussed above at ¶ 13, the remarks previously made concerning those references are incorporated here by reference.

It is urged that neither Rushmore nor Kopf discloses or suggests the invention claimed herein for the reasons discussed previously. Neither Rushmore nor Kopf, nor the combination thereof, suggests or discloses the support device claimed herein. Nor could they disclose or suggest, of course, that the support device claimed here could be used for supporting a rotor spindle in a centrifugal separator, as claimed herein. Neither do these references discuss or

suggest the problem of providing a proper damping as well as a balanced stiffness, unlike the instantly-claimed device.

It is urged, therefore, that claims 1-10 would not have been obvious to one of ordinary skill in the art over the cited references at the time the claimed invention was made. The rejection has therefore been overcome. It is urged, as well, that claims 11-20 are also allowable over the asserted combination for at least the same reasons.

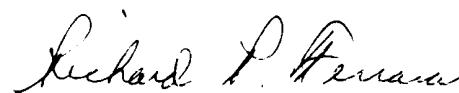
CONCLUSION

Attached is a marked-up version of the changes being made by the current amendment.

Applicant asks that all claims be allowed. Enclosed is a \$110 check for the Petition for Extension of Time fee. Please apply any other charges or credits to Deposit Account No. 06-1050.

Respectfully submitted,

Date: 1-11-2002



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Version with markings to show changes made

In the Title:

Page 1, line 8, change "A Support Device" to --A Support Device for Supporting a Spindle and a Centrifugal Separator Having Such a Support Device--.

In the specification:

Please replace the paragraph at page 2, lines 5-36, with the following rewritten paragraph:

--WO 89/10794 discloses an example of such a known support device for a centrifugal separator having a centrifuge rotor which is rotatable in a frame member by means of a bearing member. The support device comprises a number of support members extending radially outwardly from the bearing member and which each encloses a helical spring element. Consequently, these support members are arranged to permit relative radial movements between the centrifuge rotor and the frame member by being compressed in a respective space of the frame member. The helical spring elements thereby act on a piston movable in the space and abutting the outer wall of a bearing housing. By means of the spring constant of the helical spring elements, a certain stiffness of the known support device is obtained, which together with the resiliency of, for instance, the rotor spindle, determines the critical number of revolutions of the centrifuge rotor. In centrifugal separators, the helical springs of this type have to be dimensioned to the frequently very high stresses and fatigue risks to which they are subjected. The dampening of the radial movements is obtained by means of the friction which arises between the piston and its contact surfaces, in particular the outer wall of the bearing housing. The friction which arises results, in addition to the dampening of the relative movements, also in the generation of heat. Such a heat generation is not desirable and forces the bearing to operate at a relatively high temperature, which reduces the lifetime of the bearing. Another problem is that the arrangement of moving pistons is rather space requiring. Such a space may be difficult to provide for the support device in a centrifugal separator, in particular outside the so-called neete bearing. In addition, these known support devices have a rather complicated construction.

which of course makes the manufacture and the mounting [labour] labor demanding and expensive. In addition, it is difficult to conduct heat away from the bearing member.--

Please replace the paragraph at page 3, lines 11-36, with the following rewritten paragraph:

--This object is obtained by the support device initially defined, which is characterized in that each support member comprises a rubber material provided at least in said space and arranged to increase the stiffness of the support member and at the same time to provide a dampening action of the support member. By such a support member, a desired stiffness may be obtained by dimensioning the helical spring elements in combination with the design and choice of hardness of the rubber material. Since the stiffness determines the critical number of revolutions of the centrifuge rotor, one may by this design of the support device obtain a desired critical number of revolutions. A suitable level of the dampening of the relative movements may be obtained by dimensioning the rubber material between the wire rounds of the helical spring element, i.e. the rubber material is, according to the invention, arranged in such a manner that it has a dampening effect to said relative movements. The incompressible rubber material will thereby be subjected to alternatively compression, expansion and therebetween [inhomogeneous] inhomogeneous loads due to shearing or bending of the helical spring element and the rubber material. By providing a rubber material in this manner in the spaces of the helical spring element, a high stiffness may be obtained by means of smaller helical springs without any risk for overload and/or fatigue. The inner friction, which dampens the oscillating movements, generates heat which is uniformly distributed and conducted by the helical spring element. In comparison with previously known, similar support devices, a support device designed in this manner is space saving.--

Please replace the paragraph at page 4, lines 11-17, with the following rewritten paragraph:

--According to a further embodiment of the invention, the wire is manufactured in a spring material, wherein the spring material is fixedly connected to the rubber material. In such a manner, the rubber material is forced to follow the movements of the helical spring element.

i.e. the dampening of the rubber material is acting continuously. Thereby, the spring material may advantageously be fixedly connected to the rubber material by [vulcanisation] vulcanization.--

Please replace the paragraph at page 7, lines 7-9, with the following rewritten paragraph:

--In all embodiments according to Figs 4-10, the resilient material of the wire is fixedly connected to the rubber material 12, preferably through a [vulcanisation] vulcanization process.--

In the claims:

Claims 1 and 6 have been amended as follows:

--1. (Twice Amended) A support device for supporting a spindle (1)[, which carries] carrying a centrifuge rotor (4) of a centrifugal separator and [which is] being provided in a frame member (7) by means of a bearing member (3) to be rotatable about an axis (x) of rotation. [wherein]

the support device (6) [comprises] comprising at least three support members (8), which are [arranged] arrangeable to absorb relative movements between the centrifuge rotor (4) and the frame member (7) and which each has a longitudinal axis (s) and is designed to be provided between the bearing member (3) and the frame member (7) [and has a] so that the longitudinal axis (s) [extending] extends outwardly with respect to the axis (x) of rotation.

wherein each support member (8) comprises a helical spring element (10), having a wire extending in an essentially helical path in such a manner that a space (11) is formed between adjacent rounds of the wire, and wherein each support member (8) comprises a rubber material (12) provided at least in said space (11) and arranged to increase the stiffness of the support member (8) and at the same time to provide a dampening action of the support member (8).--

--6. (Twice Amended) A support device according to claim 5, wherein the spring material is fixed connected to the rubber material (12) by a [vulcanisation] vulcanization.--